

C4213 Log Data Report

Borehole Information:

Borehole: C4213		Site: 216-U-1 and U-2 Cribs			
Coordinates (WA State Plane)		GWL (ft)¹: Dry		GWL Date: 03/01/2004	
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
Not Available	Not Available	March 2004	Not Available	50	Push Hole

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	0.5	6 5/8	5 1/2	9/16	0.5	50
Outside and inside casing diameters were measured using a caliper and a steel tape. The measurements were rounded to the nearest 1/16 in.						

Borehole Notes:

Using an acoustic depth device, depth-to-bottom measured 50.1 ft from top-of-casing. Zero reference is the ground surface.

Logging Equipment Information:

Logging System:	Gamma 1E	Type:	SGLS (70%) 34TP40587A
Calibration Date:	01/2004	Calibration Reference:	GJO-2004-568-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 / Repeat		
Date	03/02/04	03/02/04	03/02/04		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	49.05	49.0	19.0		
Finish Depth (ft)	49.05	0	14.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	N/A ³	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	AE097CAB	AE097CAB	AE097CAB		
Start File	AE097000	AE097001	AE097051		
Finish File	AE097000	AE097050	AE097056		
Post-Verification	AE097CAA	AE097CAA	AE097CAA		

Log Run	1	2	3 / Repeat		
Depth Return Error (in.)	NA	-1	0		
Comments	Sonde tip is just touching bottom of borehole.	No fine-gain adjustment.	Repeat section.		

Logging Operation Notes:

Zero reference was ground surface. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K , ^{238}U , and ^{232}Th) verifier with serial number 118.

Analysis Notes:

Analyst:	Sobczyk	Date:	3/08/04	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectrum as compared to the pre-run verification spectrum for the day were between 1.6 and 4.7 percent lower at the end of the day. Examinations of spectra indicate that the detector functioned normally during logging.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. The post-run verification spectrum was used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1EJan04.xls). Zero reference was the ground surface. Based on the field measurements, the casing configuration was assumed as one string of 6-in. casing with a thickness of 9/16 in. to 49.05 ft (total logging depth). Dead time and water corrections were not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole and was detected in two intervals. ^{137}Cs was detected between the ground surface and 8 ft with concentrations ranging from 0.3 to 44 pCi/g. The maximum concentration was measured at 1.0 ft. ^{137}Cs was detected between 10 and 16 ft with concentrations ranging from 0.3 to 18 pCi/g, which was measured at 14 ft. ^{137}Cs was also detected at 41 and 42 ft at a concentration near the MDL (0.2 pCi/g). Examinations of the gamma energy spectra indicate that the occurrences of ^{137}Cs at 41 and 42 ft are probably statistical flukes, because well-defined 662-keV photopeaks are not evident.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV and for ^{137}Cs at 662 keV. ^{137}Cs , based on the 662-keV photopeak, was not detected at 17 ft on the original log run; however, it was detected at 17 ft on the repeat log run. Photopeaks at 662 keV were apparent at these depths on both the repeat and original logs. However, the APTEC software did not identify the 662-keV photopeak at 17 ft on the original log run as being statistically significant.

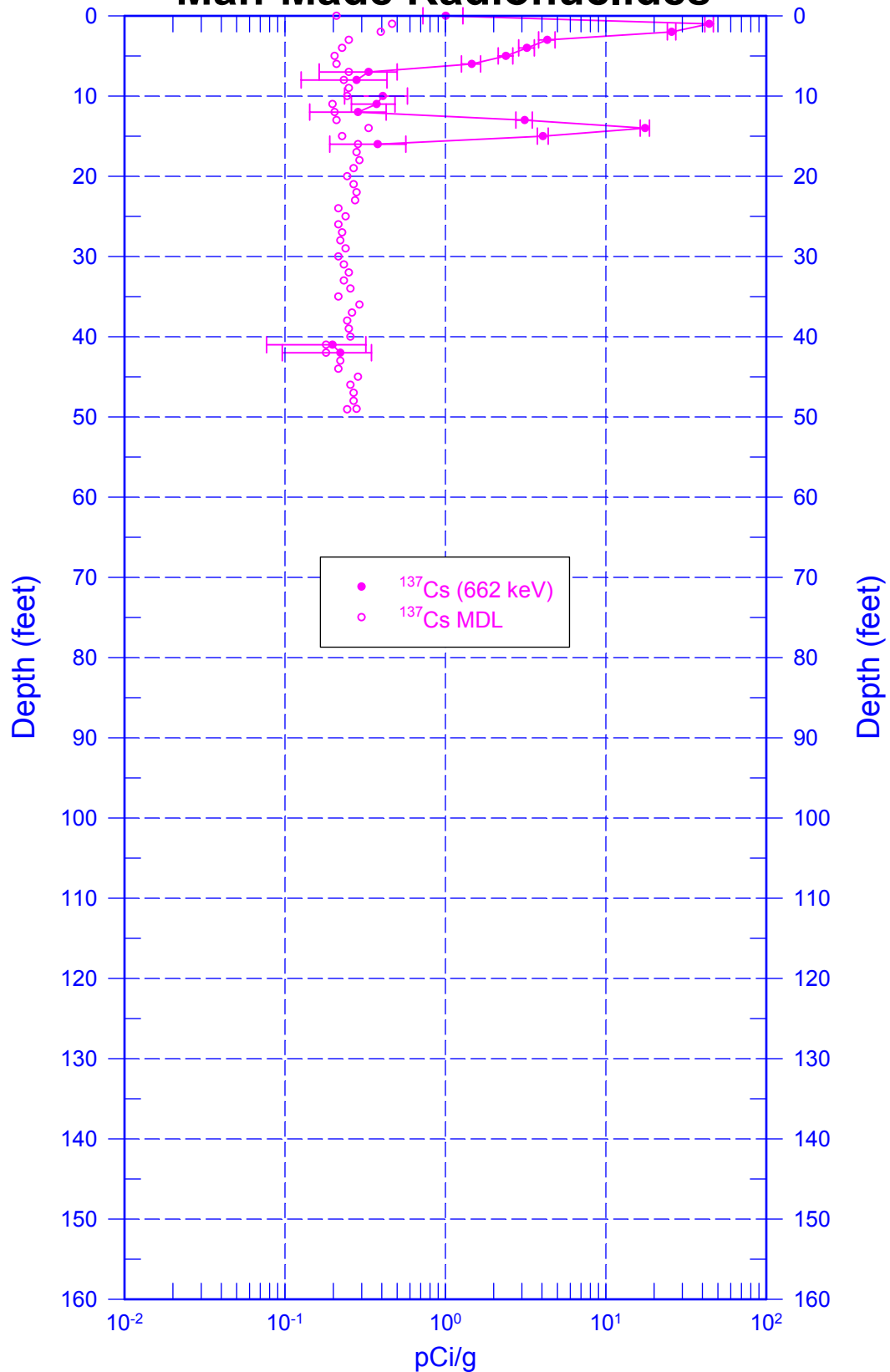
¹ GWL – groundwater level

² TOC – top of casing

³ N/A – not applicable

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Man-Made Radionuclides

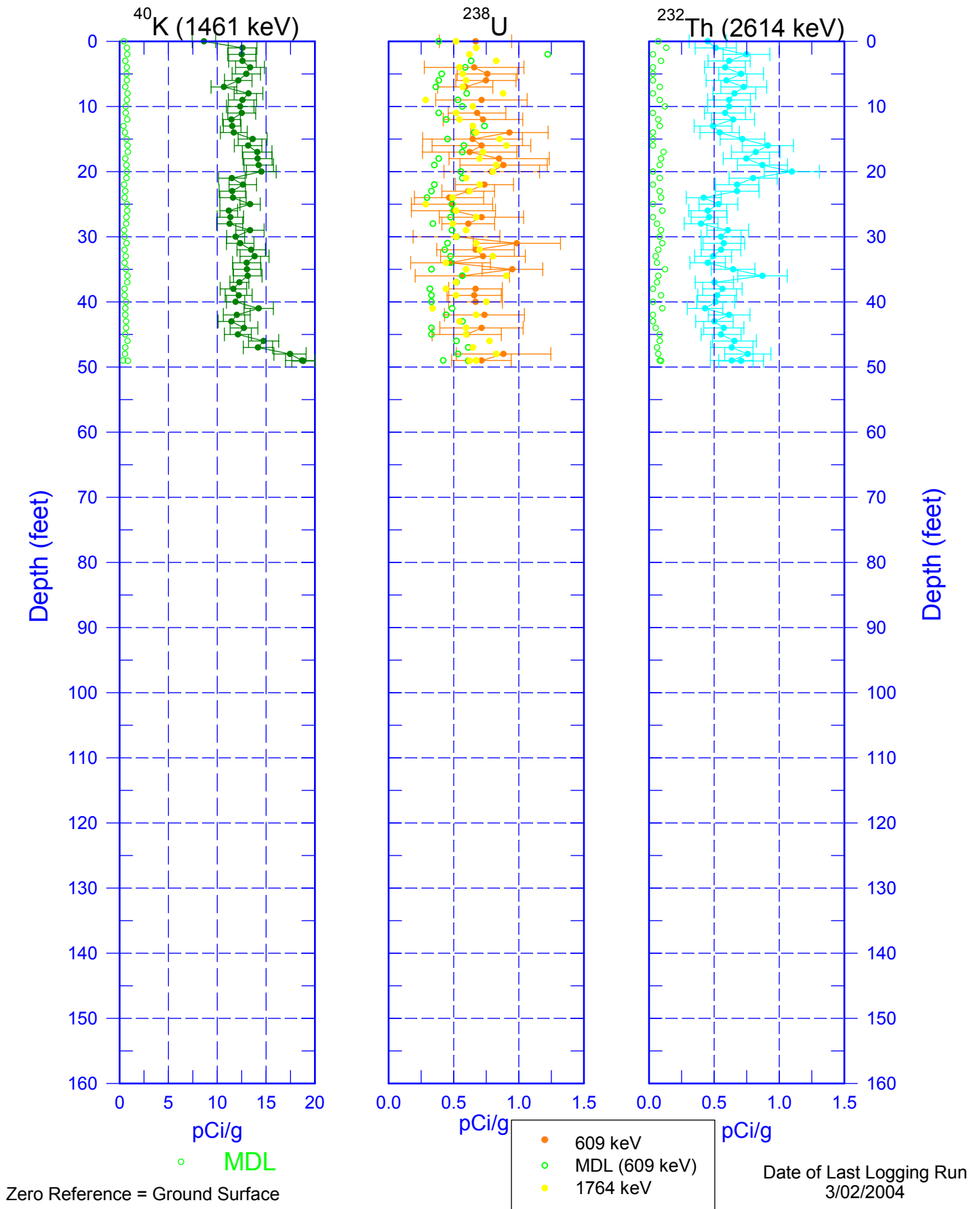


Zero Reference = Ground Surface

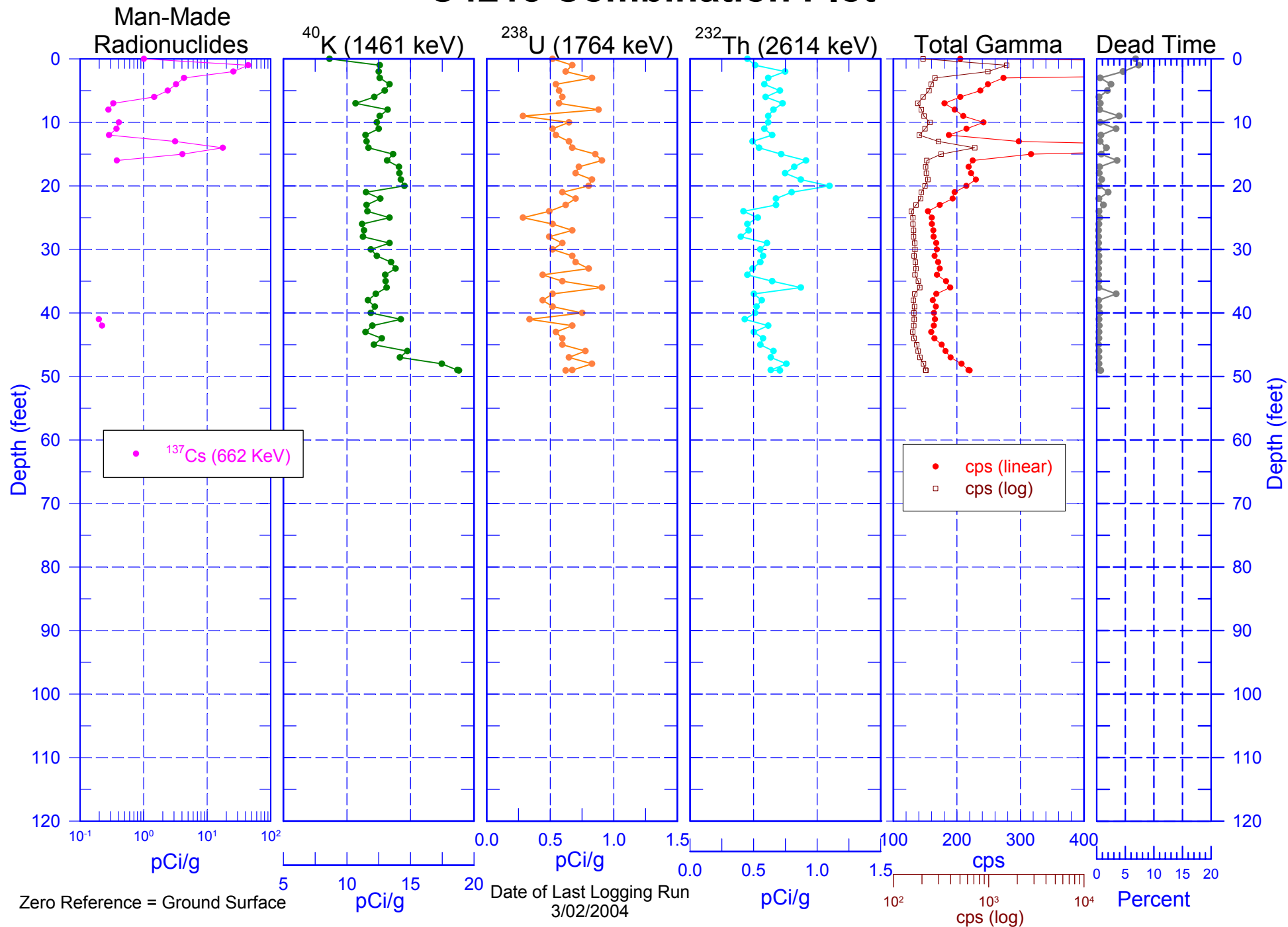
Date of Last Logging Run
3/02/2004

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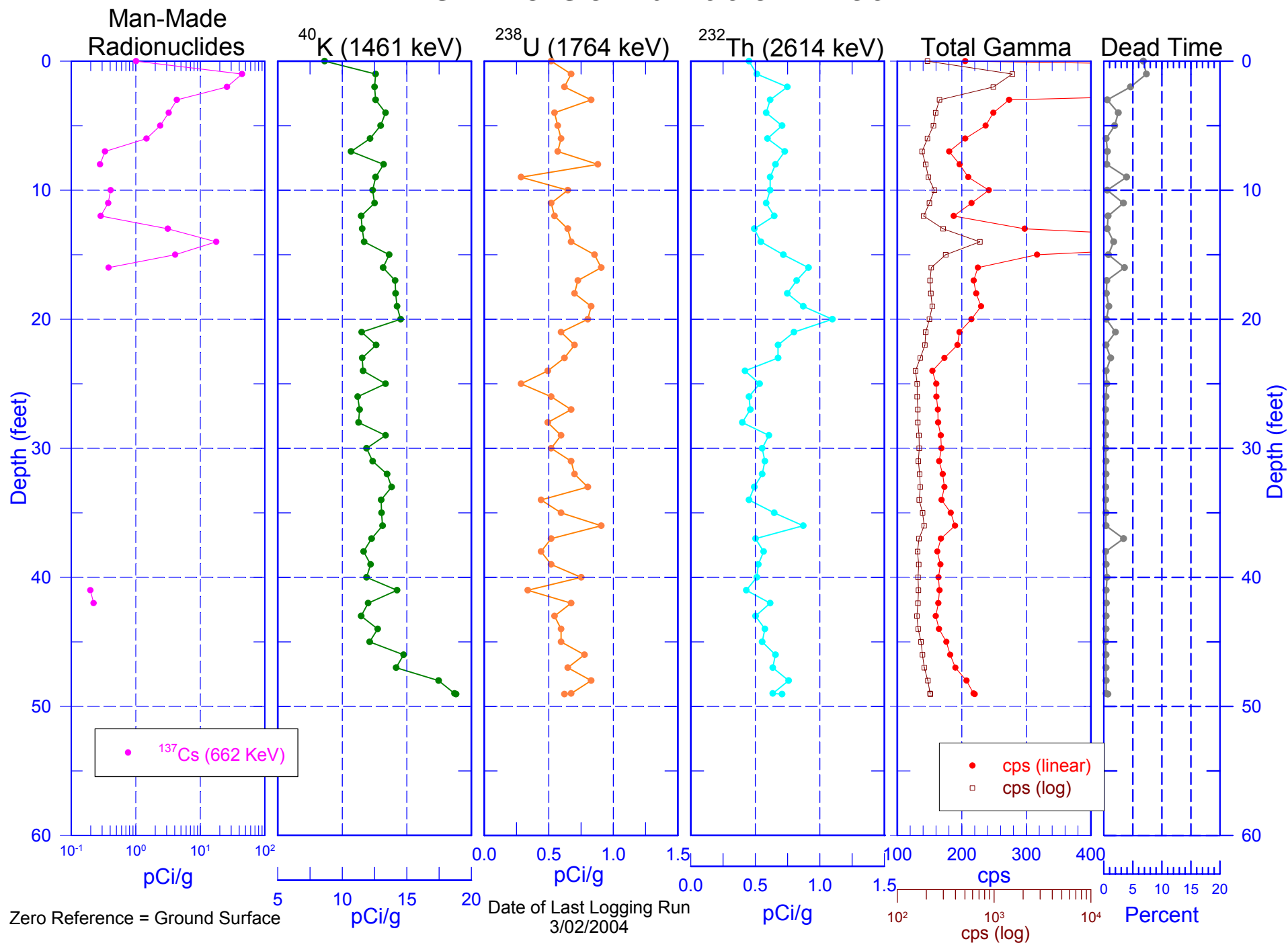
Natural Gamma Logs



C4213 Combination Plot

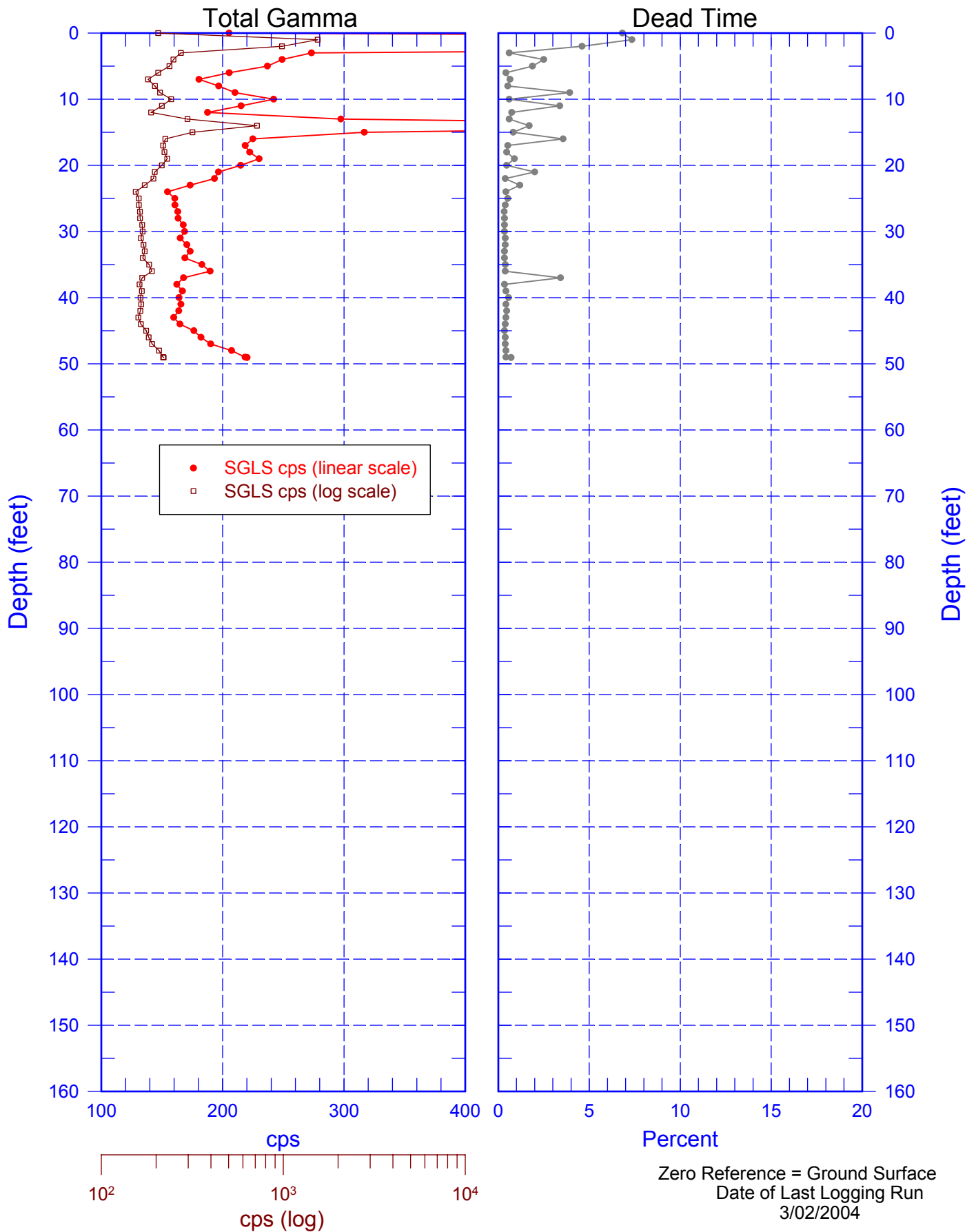


C4213 Combination Plot



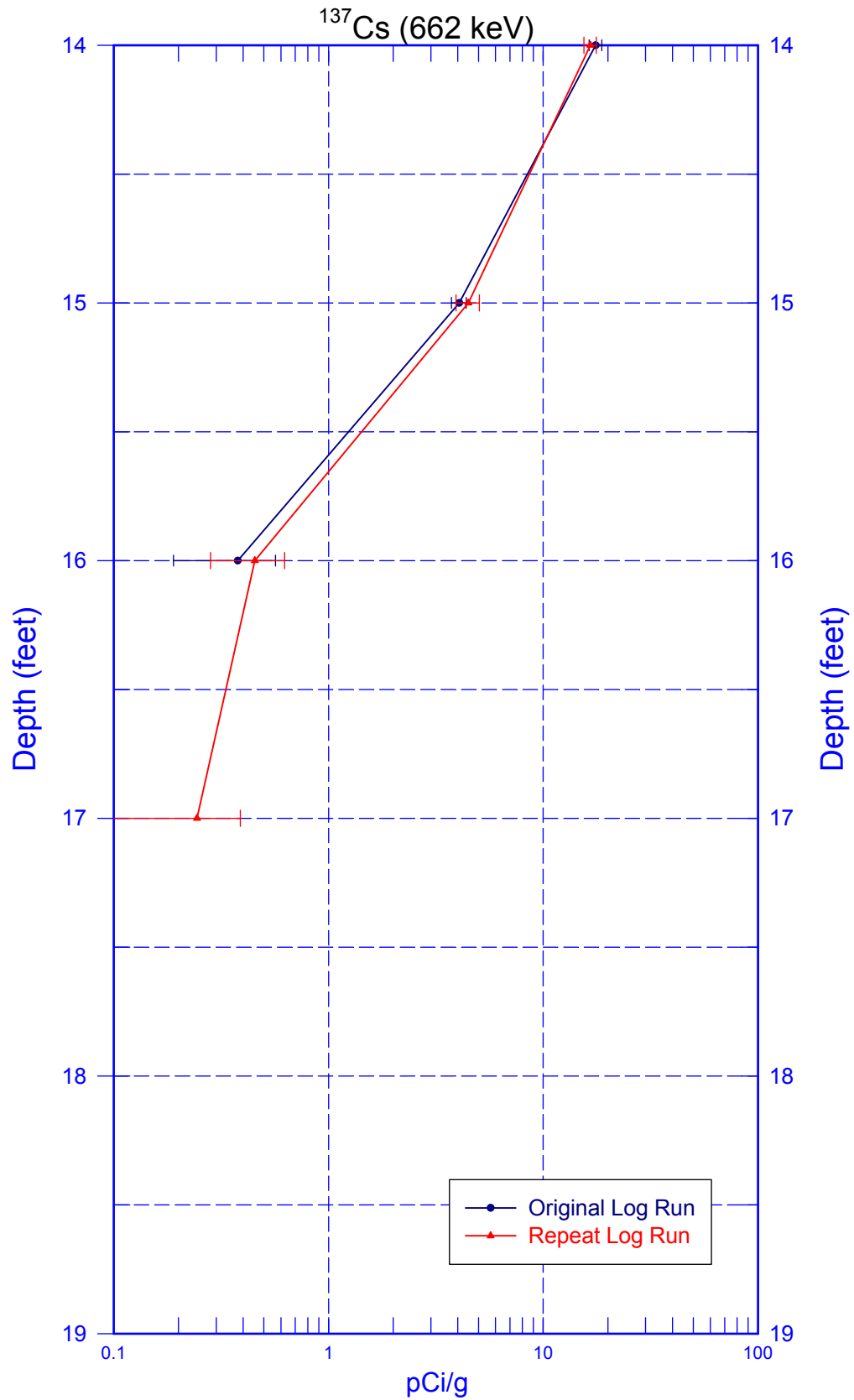
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Total Gamma & Dead Time



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Rerun of Man-Made Radionuclides



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Rerun of Natural Gamma Logs (19.0 to 14.0 ft)

